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A description of the Holland High School in Michigan is given. Individual student needs, technological equipment, and college preparatory curriculum were emphasized by the consultant and the architect who designed the building. The campus was of a decentralized plan with four small schools adjoining a common unit for science and business instruction. Flexibility and expansion space were integral parts of the building design. A field house and vocational facilities were available for community use.

The cost was given in major units, and then was broken down into building supply items including furniture and equipment, site and site development, and insurance. The cost per pupil was $2,018 which favorably compared with costs of other schools. Capacity of the school was 1,500. The citizens of the high school community felt that the design was adequate to meet the growth demands for quality education.

Photographs and architect's sketches were included.

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INSTRUCTIONAL TECHNOLOGY - U.S.C.

PROFILES OF SIGNIFICANT SCHOOLS

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education

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HOLLAND HIGH SCHOOL
HOLLAND, MICHIGAN

INSTRUCTIONAL TECHNOLOGY - U.S.C.
2906
JUL 7 '65
JUL 7

Profiles of Significant Schools

H O L L A N D H I G H S C H O O L

H O L L A N D, M I C H I G A N

Prepared by:

Donald J. Leu, Professor
and
Richard L. Featherstone, Assistant Dean

School of Education
Michigan State University

Edited by:

James J. Morisseau
Editorial Associate

September, 1962

Educational Facilities Laboratories, Inc.
477 Madison Avenue, New York 22, New York

ED002502

Profiles of Significant Schools

Communities all over the United States are building new schools. But not every administrator, architect, and school board member can tour the country looking at the latest developments in school planning and design.

To provide people engaged in school building with a detailed knowledge of the most adventurous new schools, EFL is publishing this series of reports, entitled Profiles of Significant Schools. The reports attempt to show two things: why the school was designed as it was, and how it was designed and built. In order to do this, the Profiles will explore the educational program (which may in itself be unusual), any architectural innovations the design may contain, and any special features that may be of interest, such as air conditioning, flexibility, or open planning.

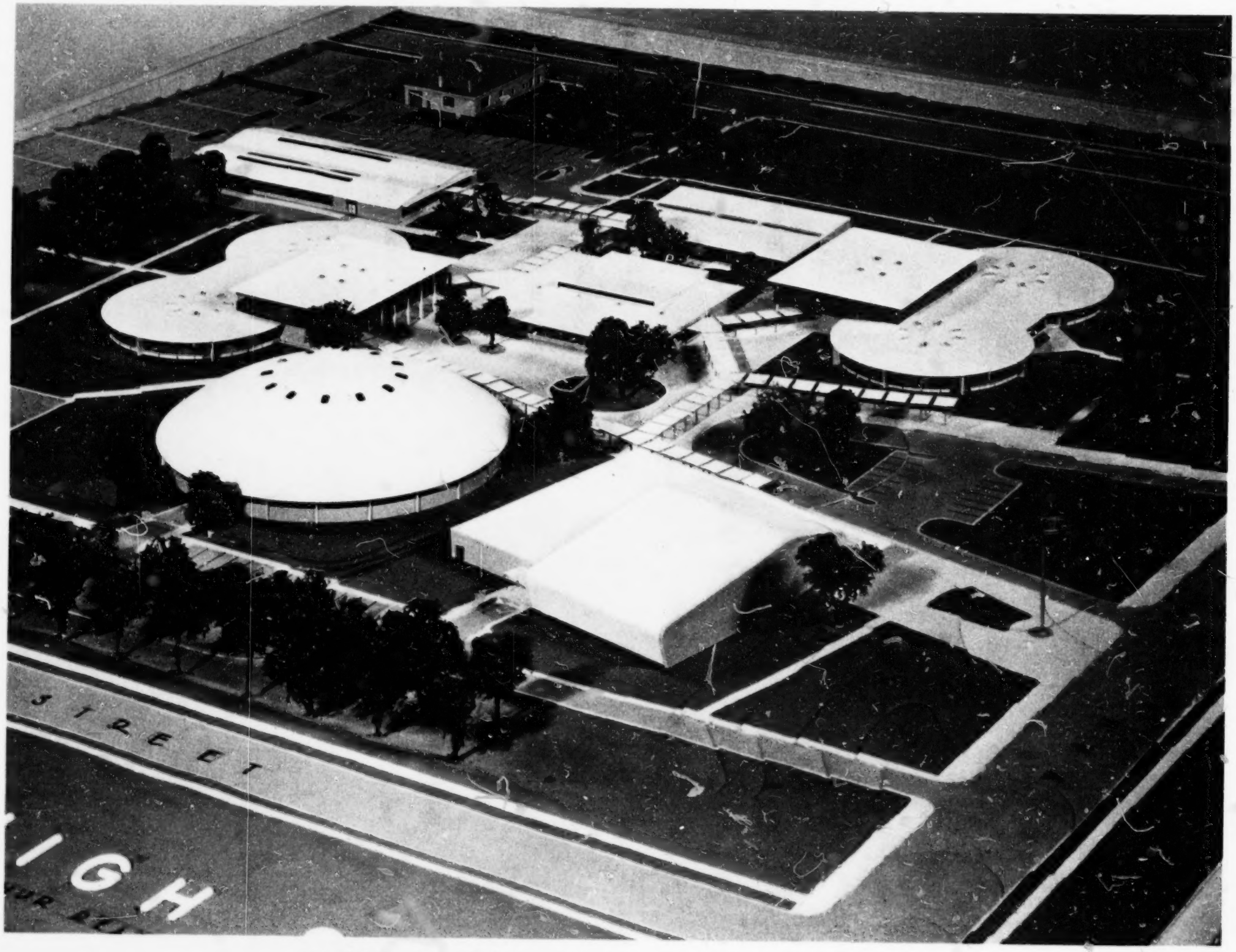
These are Profiles of individual schools, built in individual communities, to house individual programs. These schools will not necessarily serve ideally in other communities, but many of the ideas incorporated in them are applicable in many places. We hope that people involved in school planning and building will find the ideas stimulating and useful.

ED003502

HOLLAND HIGH SCHOOL

HOLLAND, MICHIGAN

Capacity Enrollment:	1,500 students
Capacity with Planned Addition:	1,800
Current Enrollment:	817
Grades:	10 - 12
Architect:	Suren Pilafian
Building Consultant:	Arthur Read
Superintendent:	Walter W. Scott
Curriculum Study Director:	J.J. Riemersma
Principal:	Jay W. Formsma



Architect's Model of Holland Senior High School

There is something monumental about the new Holland High School in Holland, Michigan. The effect, created by a huge, domed field house that dominates the school's 40-acre campus, does not seem inappropriate.

The school, in a sense, stands as a monument to a community that, ever since its founding in 1847, has placed a good educational system at the top of its list of priorities.

And, in many ways, it is a monument to the dynamics of educational change in the United States, circa 1962. It is a school built around a new educational program that, in turn, is built around the needs of the individual student. As such, it incorporates an impressive number of the educational and architectural innovations that have appeared in the American secondary school over the past few years.

Holland, Michigan, was settled by a group of Dutch immigrants, members of the Dutch Reformed faith, who carved their new home out of what then was still frontier territory in west central Michigan. A school was one of the first structures built by the settlers and an American schoolteacher one of the first outsiders asked to join the community. Hope College, now a highly-regarded liberal arts institution affiliated with the Reformed Church in America, was started as an academy when Holland was only five years old.

The city's public schools enroll 3,855 pupils in kindergarten through the twelfth grade. The Christian School Society operates a parochial school system for another 2,526 pupils, many from outside the school district. The city's Roman Catholic elementary school has 393 pupils and the Seventh Day Adventist school, 31.

The Problem

It had been apparent for some time that Holland needed a new high school. The old one, built in 1912, was designed for only 450 students. By 1950, the enrollment had reached 800. The overflow had to be housed in the junior high school and in rented quarters in a church, a store and an old house. Ten years later, an upsurge in junior high school enrollments and the annexation of several smaller school districts tipped the scales. In February, 1960, the voters approved a $3,250,000 bond issue for a new high school and additions and renovation work at other schools.

Meanwhile, Holland's educators had been planning for the anticipated new buildings. Seven years earlier, they had undertaken a full-scale study of the community, the students and their needs. Object: a curriculum that would keep pace with those needs. The study was complete and its findings translated into a new high school program when the decision to build was made.

Among other things, the study turned up a widening of the gap between the educational needs of different pupils. As in most communities, there was the matter of differing levels of ability. Then, about half of Holland's high school graduates were going on to college; the other half were not. Stiffer competition and tougher requirements for college entrance made new demands on the college preparatory curriculum. But a postwar shift in the area's industrial development intensified Holland's problems. There was a demand for fewer unskilled or semi-skilled workers and for more skilled labor, a situation that had obvious implications for the high school and its vocational and general programs.

The answer, the educators decided, lay in a comprehensive curriculum, effective guidance, and, most important, a school program tailored to the needs of the individual student.

A New Program

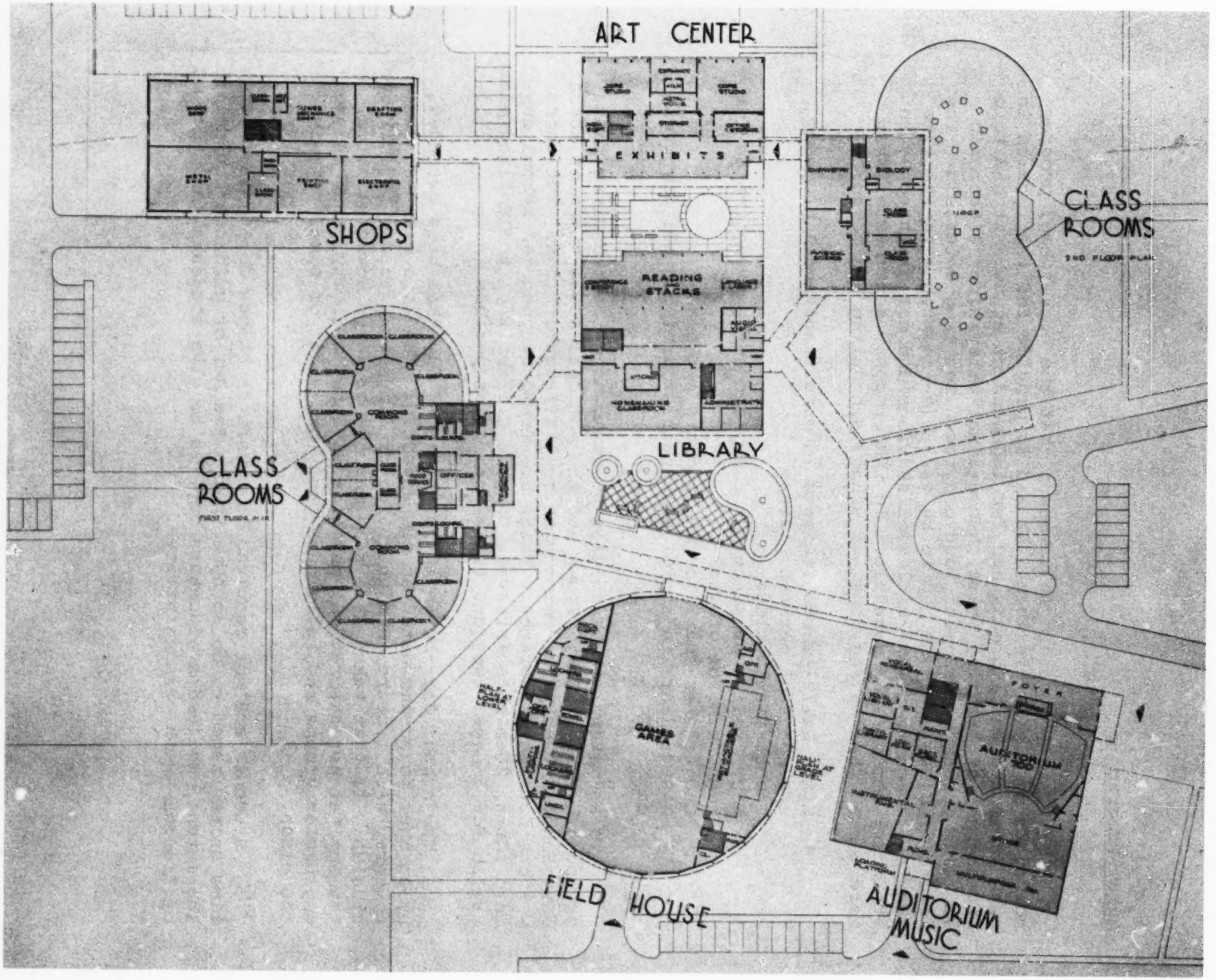
This, the educators felt, meant that the high school program needed to be highly flexible. It had to provide for instruction in both large and small groups and for independent study. It had to permit the use of teaching teams, educational television, electronic language teaching equipment, and programed teaching materials. The length of class sessions had to be variable--adaptable to the time required to cover a logical lesson sequence and not dictated by an arbitrary school-wide schedule. In the process, a number of what were termed the "sacred cows" of school scheduling had to go:

* Study halls--where students in more traditional programs are "parked" between classes
* The 55-minute class
* Four "solid" subjects for every student--why not three for some, six for others?
* One teacher and 25 or 30 students per class
* All students in school and under supervision all day every day

To an extent, the resulting program was patterned after that proposed by Dr. J. Lloyd Trump and the National Association of Secondary School Principals' commission on staff utilization. But there was one notable difference. Where Dr. Trump divided the school day into short, 20-minute intervals to gain flexibility, the Holland plan called for longer, two- and three-hour class periods.

The school day--but not the students' day--has been extended by an hour to accommodate the new schedule. Teachers are encouraged to carry each lecture, demonstration or dicussion to its logical conclusion. If that takes less than the two or three hours allotted, the teacher, at her discretion, may turn to a new activity, such as small discussion groups and individual study projects, or simply dismiss the class.

Students are not required to remain on campus during their free time unless asked to do so by either a teacher or guidance counselor. The intent, Holland's educators say, is to give students "a good deal of freedom--with responsibility".

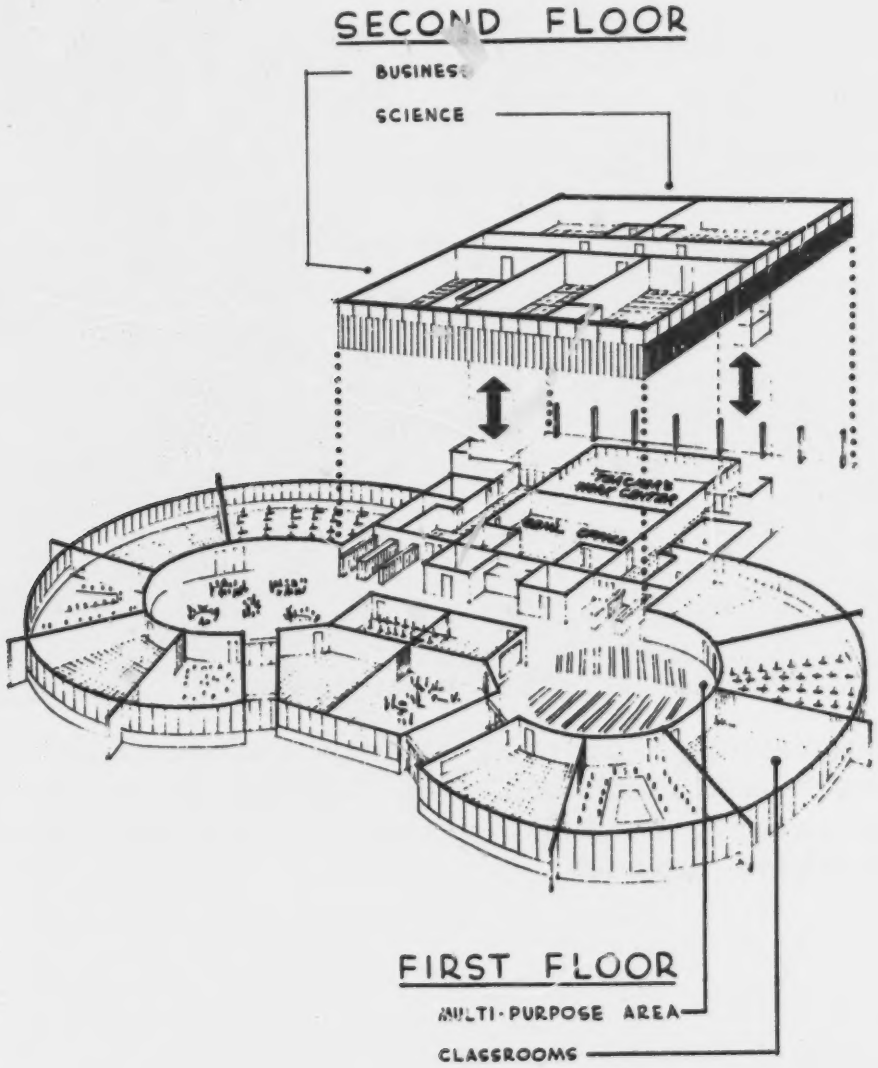

ART CENTER
EXHIBITS
SHOPS
READING
STACKS
CLASS
ROOMS
2ND FLOOR PLAN
LIBRARY
CLASS
ROOMS
FIRST FLOOR PLAN
GAMES
AREA
FIELD HOUSE
FOYER
AUDITORIUM
AUDITORIUM
MUSIC

A New School

Holland's educational philosophy and its new high school program were handed to the building consultant and architect with instructions to design and build a new school to fit them.

The result is a campus or decentralized plan in which the student body is split into four "small schools," each having 300 students selected at random from all three grade levels. The intent is to gain small-school intimacy in a large-school operation. (Optimum capacity of the school is 1,200; actual rated capacity, 1,500.)

Each small school has its own one-story wing in one of two, 600-student classroom buildings. The small-school units are wheel-shaped, with classrooms forming the rim and an open "commons area," the hub. A rectangular second story on the classroom buildings houses facilities for science, typing and business-machine instruction. These are shared by the two small schools in the building.



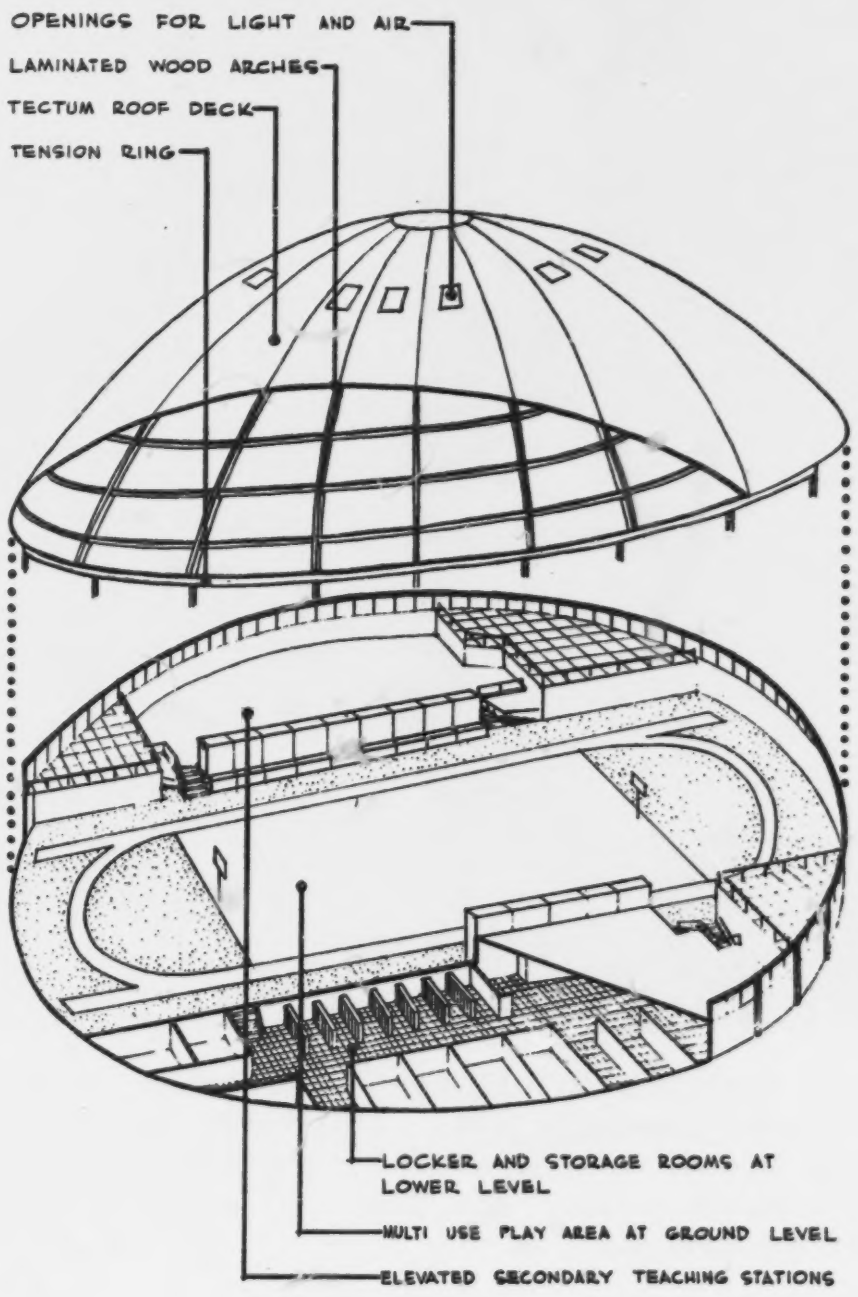
The classroom buildings include office space for guidance counselors, one of whom is assigned to each small school, and for the building chairman or "housemaster." Teachers have a separate workroom and lounge. And two small seminar rooms are located between the commons areas.

The campus has been laid out to permit the addition of a third, 600-student classroom building when expansion becomes necessary. All other facilities are designed to accommodate an eventual enrollment of 1,800.

The campus has a central library rather than library or resource centers in each small school. The library building also houses the language laboratory, an audio-visual center, homemaking classroom and administrative offices.

Space for instruction in vocal and instrumental music is provided in the auditorium. In this way, it is expected that the 700-seat auditorium can be put to frequent use as a teaching station in the music program rather than left to stand idle for most of the week.

The dominant feature of the campus is a circular field house, 180 feet in diameter and capped by a 41-foot high radial dome. Its split-level interior provides a main play area consisting of a basketball court and indoor track, flanked on either side by locker and shower areas on a lower level and two spaces for organized gym classes at the upper level. Folding bleachers seat 1,600 and will be added to later to bring the capacity to 2,400. The building is suited to both the physical education program and large school and community gatherings.


OPENINGS FOR LIGHT AND AIR
LAMINATED WOOD ARCHES
TECTUM ROOF DECK
TENSION RING
LOCKER AND STORAGE ROOMS AT LOWER LEVEL
MULTI USE PLAY AREA AT GROUND LEVEL
ELEVATED SECONDARY TEACHING STATIONS

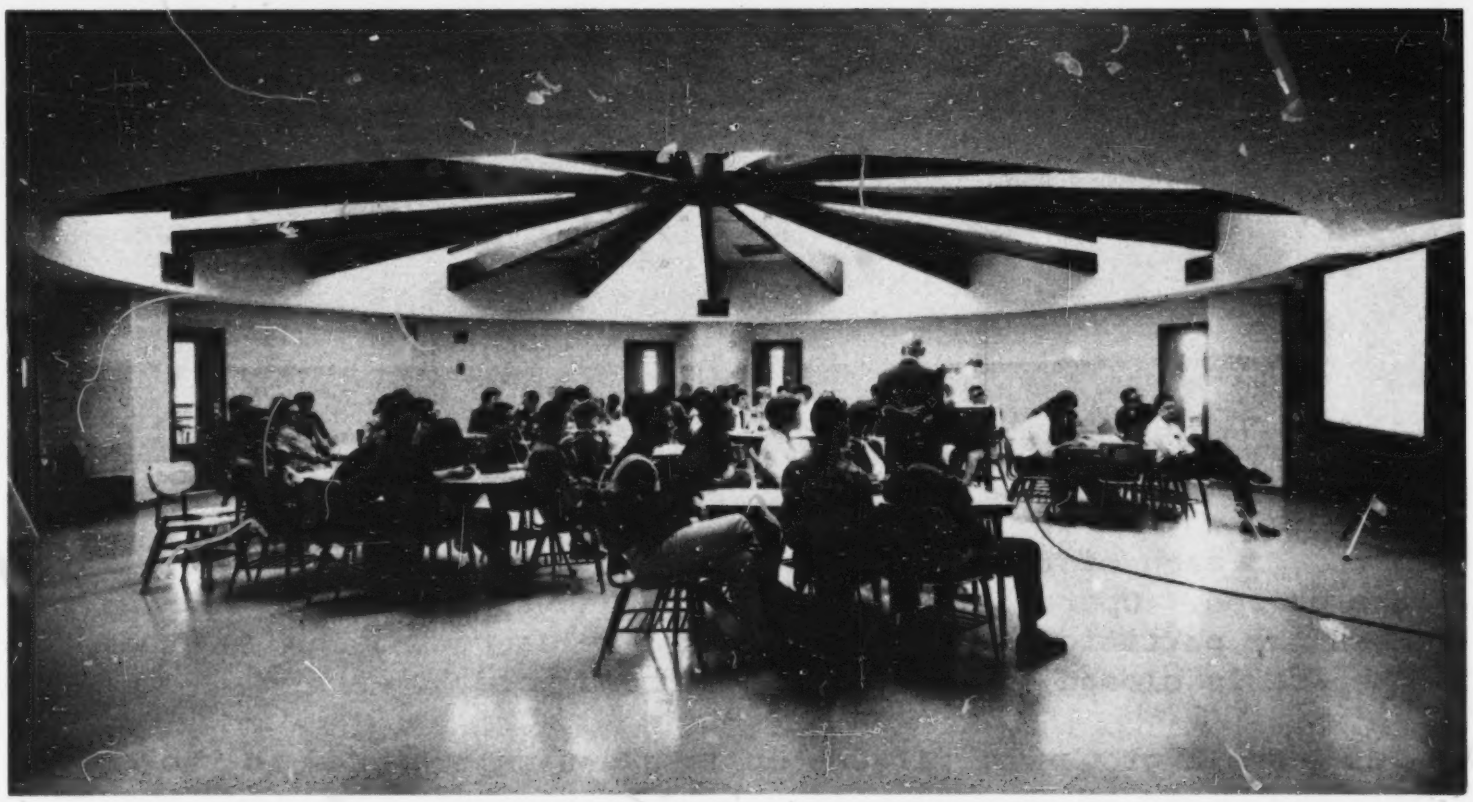
Shop facilities for the school's vocational courses in woodworking, metalworking, power mechanics, printing, drafting and electronics are located in a separate, factory-type structure. The facilities and atmosphere are much like those many of the vocational students will find when they go to work.

The campus includes an art center, notable in that it was designed for both school and community use. It houses two large teaching studios, a ceramics studio, metal sculpture shop, office and storage areas and a spacious exhibit hall. The $143,000 structure was donated by a former resident of Holland.

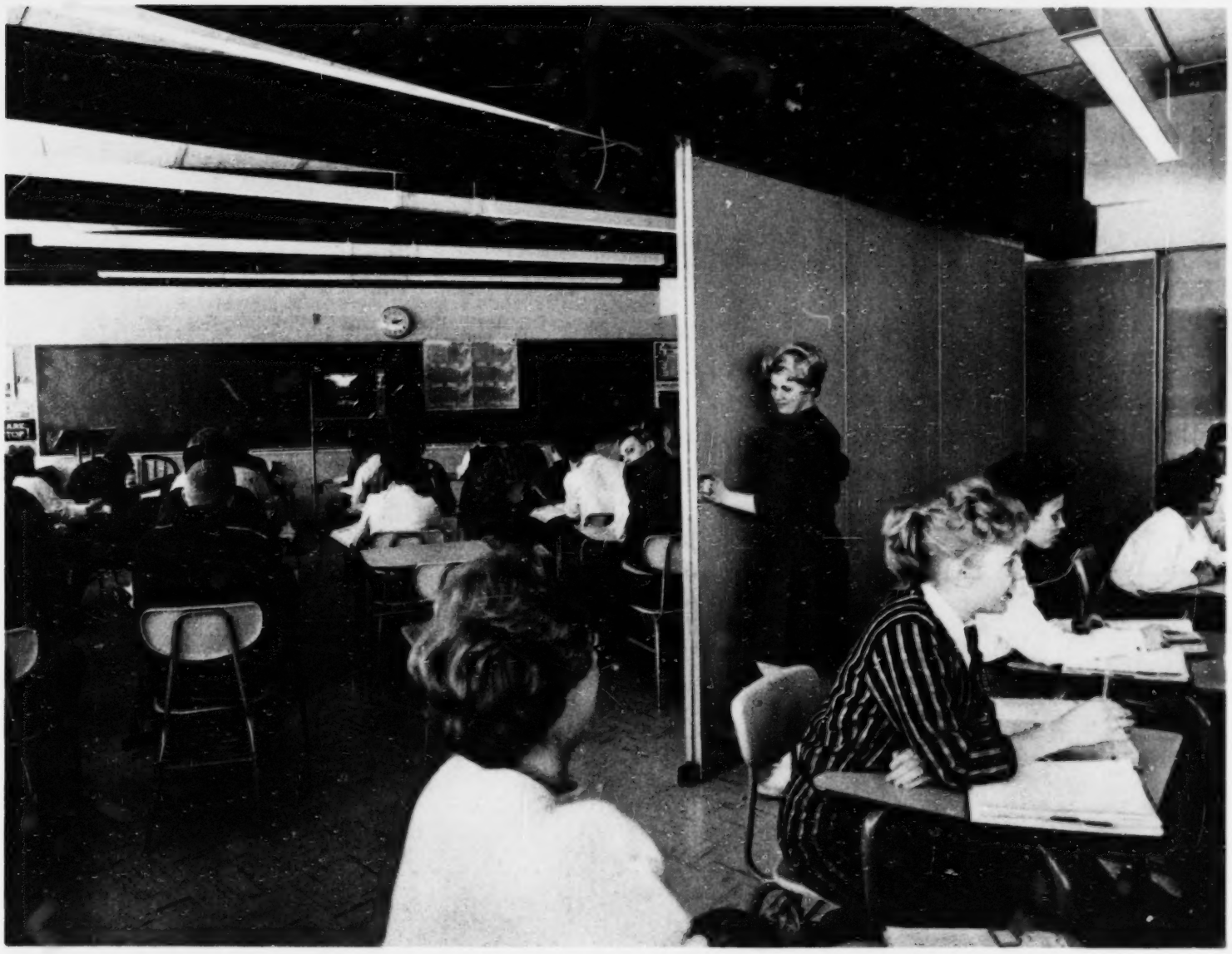
A small brick and concrete building, acquired with the 42-acre site, houses a central heating plant for the campus. The auditorium and art center are air-conditioned and all other campus buildings have been designed so that air conditioning can easily be installed later on.

A School for Today and Tomorrow

Holland High School was designed to provide spaces adaptable to large and small group instruction and individual study. At the same time, there was an attempt to avoid one stumbling block in more conventional designs--the tendency to freeze the educational program by squeezing it into immutable spaces.

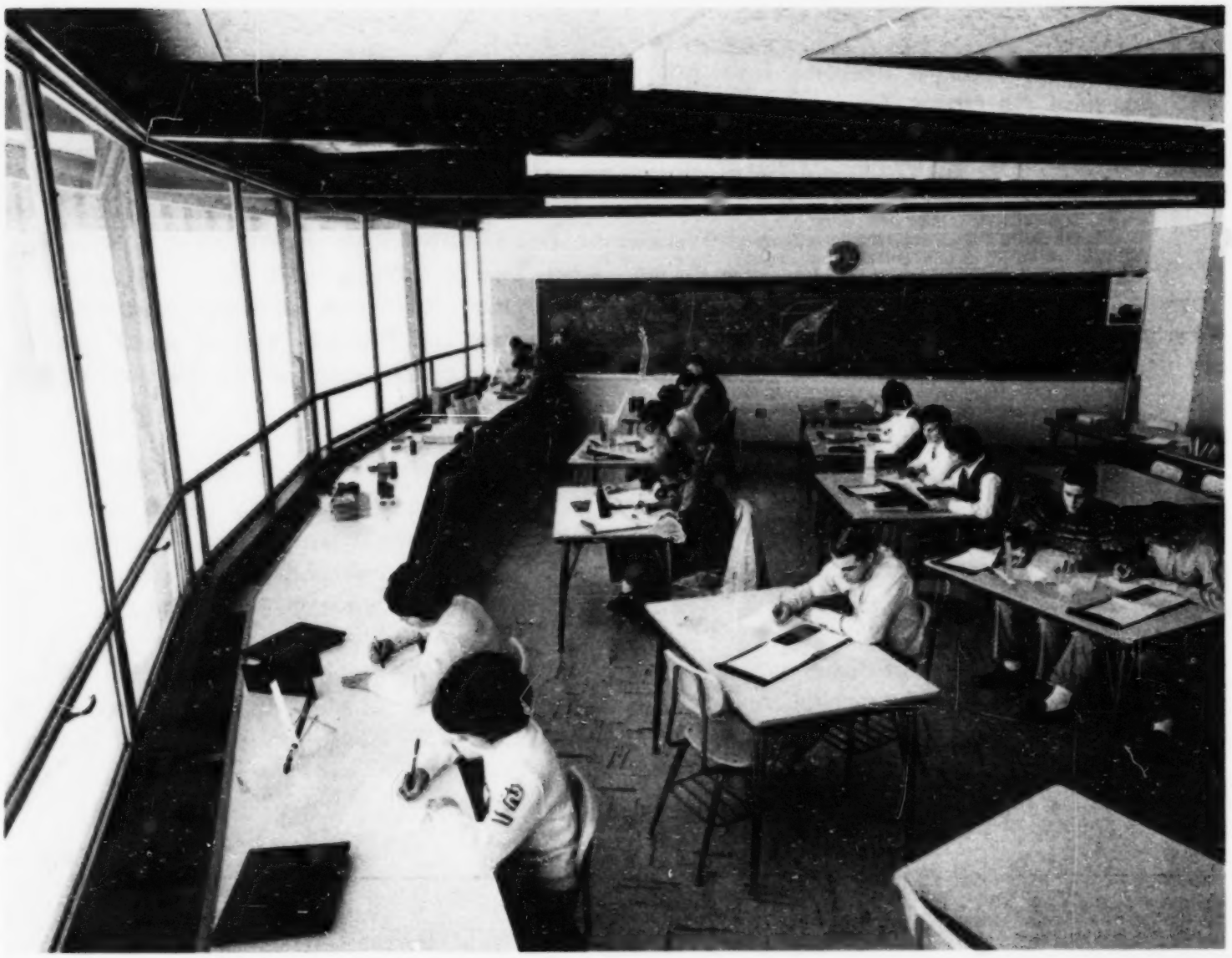


Large groups can be accommodated in the field house, which holds the entire student body; the auditorium, which seats 700, and the four commons areas, which accommodate 150 each.



In each of the small school wings, all but one of the classrooms are paired. Operable, but sound-retardant walls divide each pair. When the partition is open, the double classroom holds 70 students. When it is closed, the single classrooms hold 30 each.

Small groups of fifteen or less can be assigned to the small seminar rooms or to conference rooms in the library. The seminar rooms also are paired and can be combined to hold 30 by opening a partition.



Individual study space is provided in each classroom--two or three student carrels are built into the cabinetwork along the window wall. These can be used when the classrooms are empty or when a teacher decides to give individual attention to a student during a class session. And there is a scattering of carrels in the library.

The design, however, does not commit Holland to the new program. If there are unforeseen changes in educational technology (or a reversion to the traditional program), the school can be altered to fit them at reasonable expense. Most existing spaces lend themselves to a variety of uses. And, in the classroom buildings, all interior walls are non load-bearing and can be removed if a rearrangement of space is desired. The job cannot be done overnight, but could be accomplished in the course of a summer.

The Coin-Operated Lunch Hour

Holland High School has no cafeteria and no kitchen. Students who do not go home for lunch or bring it with them must purchase their food from vending machines located between the two commons areas in each classroom building. The commons areas serve as lunchrooms.

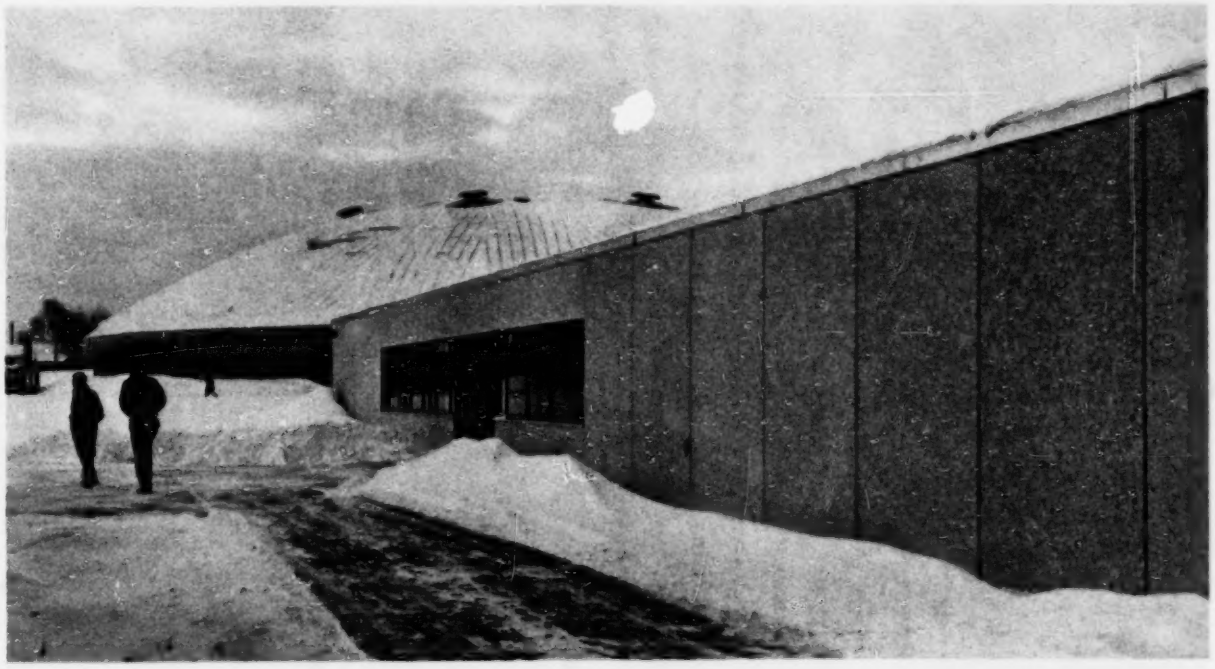
Holland's taxpayers have always felt that the feeding of students should be the function of the home, not the school. No more than a token lunch service ever was offered at the old high school and that was abandoned three years ago. Vending machines were tried last year at the old school with little success. But they appear to be working well in the new building.

Students have their choice of cold or hot sandwiches, hot canned soups or foods (such as hash), fresh fruit, cakes, candies and milk. Hot plates of the TV dinner variety are under consideration. Teachers, incidentally, share the same fare and the same machines. A coffee machine is set up in each teachers' lounge.

The vended lunches cost more than would regular lunches if the school operated a kitchen and took advantage of state and Federal school lunch subsidies (something it has never done). Milk is the only subsidized item, selling for four cents a container.

It may seem out of character for conservative Holland to have built an unconventional, unconservative school. But an observer of the local scene explained that the citizenry was convinced the design was educationally desirable. And education, he added, was the paramount consideration. Nevertheless, the school may well have appealed to the community's instinct for thrift.

Multiple-story construction was held to a minumum. Only the science-business areas of the classroom buildings are above the first-story level. Thus, exposed wood and steel beams could be used in framing, without violating the building codes, at a substantial saving over the cost of the fire-resistant construction required for multiple-story structures. At the same time, dramatic architectural effects could be achieved through the use of laminated wood beams in classroom, library, commons area and field house ceilings.



Throughout the school, the architect sought to make the fullest use of factory-built components and thus hold on-site labor to a minimum. The exterior walls of the classroom wings, library, auditorium and art center are precast concrete sandwich panels, six inches thick. The exterior two inches is concrete with exposed aggregate for architectural effect. The "filling" is fiberglass and the interior two inches, concrete.

Corridors and stairways were all but eliminated in the design and all non-teaching spaces, including closets, mechanical and maintenance rooms and toilets, held to a low 16.7 per cent of the total building area.

WELCOME

Field House

The field house approach to providing physical education facilities offered other economies. No effort was made to compare its cost with that of a conventional, rectangular gymnasium. But other communities that have built domed field houses found them less expensive than the conventional gym.* And Holland's field house cost $11.20 a square foot to build, in contrast to the average $13.70 a square foot cost of the entire project.

The costs of erecting the dome were held down through a design approach that made unnecessary the extensive form work required in the erection of most dome-shaped structures.

A steel compression ring, which forms the apex of the roof, was raised into position on scaffolding. Then, using three cranes, the contractor simultaneously lifted three of the 24 laminated wood roof beams into position at points equidistant around the circumference of the dome.

In place, the 94-foot curved beams pushed inward against the compression ring and outward against a tension ring running the circumference of the dome. When the three were secured, the roof framing or skeleton, though far from complete, was structurally stable. The scaffolding then could be removed and the other 21 roof beams dropped into place.

The completed roof is like a dome-shaped cap on a shallow jar. The dome rests on 24 exposed steel columns. But, since all outward thrust is contained by the tension ring, none is exerted on the columns. The space between columns is enclosed by non load-bearing walls of concrete block and steel windows.

The dome turned out to have remarkable acoustical qualities, demonstrated when the University of Michigan Concert Band performed recently in the building. On one hand, there was no distortion when the 155-piece band played at its loudest. On the other, a speech by the bandmaster, made without benefit of a microphone, was heard without difficulty by everyone in the audience.

* See Conventional Gymnasium vs. Geodesic Field House; EFL, 1961, for a comparative study conducted in Bethesda, Maryland.

Vocational Shops

With the exception of its concrete slab floor, the shop building was virtually all factory-built. The steel framing, steel sandwich wall panels and corrugated steel roof sections arrived on site much like an oversized erector set and had only to be put together. The result is a utilitarian, industrial-type structure, but one that is not unattractive. It cost only $8.78 a square foot to build.

The Building Consultant

Holland schoolmen attribute some of their construction economies to the decision to hire a building consultant for the project. Building consultants are not uncommon in commercial construction projects. But rarely, if ever, have building consultants, as distinguished from educational consultants, been involved in school construction.

The consultant, Arthur Read, of Holland, was involved in the project long before the architect was hired. He helped survey the community's building requirements and prepared preliminary cost estimates. He assisted in the selection of the architect, Suren Pilafian of Detroit, and engineers for the project.

He acted as co-ordinator of the faculty committee that laid out the educational specifications for the school, interpreted those specifications to the architect and engineers, and aided in the translation of the educational specifications into building design and specifications.

In terms of cost, perhaps his most significant role was in the control of bidding and contracts. In effect, he functioned as general contractor. Construction work, equipment and furnishings were divided into more than 20 prime or direct contracts, all under the consultant's control.

Sub-contracts were eliminated, thus avoiding the commissions and mark-ups that normally occur in the sub-contracting process. Construction was expedited and the school was opened only 14 months after work started.

The consultant also supervised construction, a function normally required of the architect and engineers. In return, the architects and engineers gave credits to the Board of Education covering all but about 10 per cent of the consultant's fees and expenses.

The Finished Product

However it was accomplished, Holland got a new high school that compared favorably in cost with others put out for bid in Michigan at about the same time. The following are comparative cost figures, covering only structural, mechanical and electrical contracts, released by the Michigan State Department of Public Instruction (with the warning that such comparisons can be misleading).

School	Student Capacity	Area in Square Feet	Cost Per Square Foot	Square Feet Per Student	Cost Per Student
Holland	1,500	161,033	$13.70	108	$1,471
Community "A"	1,500	219,000	$14.68	146	$2,142
Community "B"	1,400	162,834	$12.74	116	$1,481
Community "C"	660	134,578	$14.77	204	$3,010

The Holland figures are based on a total construction cost of $2,306,380. Site purchase and development, furniture and equipment, insurance, and professional fees and services brought the total cost to $3,027,596 or $2,018 a pupil. Comparable figures are not available for the other schools.

It is too soon to judge the school's performance, either structurally or in terms of its suitability to the new academic program and to a good educational environment.

The layout apparently lends itself to the new technology. Televised history courses broadcast by the Midwest Project in Airborne Television Instruction are viewed by classes of 70 in the double classrooms. Team teaching is being tried in the biology program. And programed learning materials are in use in solid geometry classes.

The campus design and the staggered class schedule appear to have eliminated student traffic jams. There are no bells to mark class changes. There are, in effect, no hallways. Students never seem to move in groups of more than four or five. Except at lunch hour, the visitor is unaware that classes are changing at all.

The new building, the new program, or both may be responsible, but Jay W. Formsma, principal, can tell his visitors:

"Discipline problems have all but disappeared ... Attendance has improved ... The students seem more mature ... Our problem now is to get them to leave when it is time to go home."

The Cost Picture

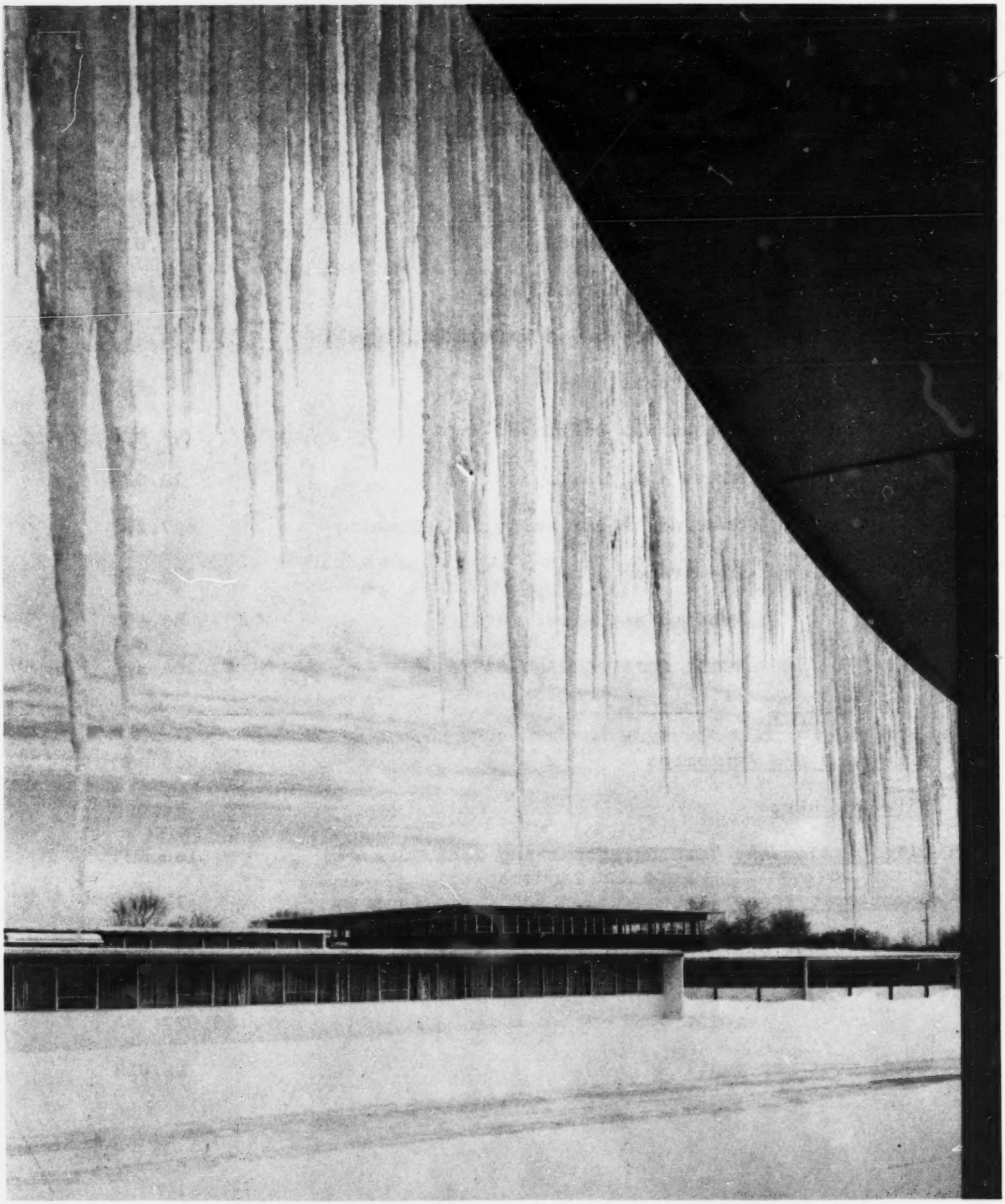
Building	Area in Square Feet	Volume in Cubic Feet	Construction Costs	Costs Per Square Foot
Field House	36,246	726,882	$ 406,110	$11.20
Auditorium	17,743	310,502	308,118	17.36
Library	13,128	200,664	164,543	12.53
Art Center	8,886	133,290	143,009	16.09
Shops	14,110	225,760	124,000	8.78
Central Heating	5,460	76,440	26,000*	4.75*
Classroom Unit	31,962	318,012	513,600	13.87
Classroom Unit	33,498**	333,372**	521,000**	15.58**
TOTALS	161,033	2,324,922	$2,206,380	$13.70

* Conversion of existing building.
** The classroom units are identical except that the second includes extra basement space for electrical transformers.

Total construction costs	$2,206,380.00
Construction costs per square foot	$13.70
Construction costs per cubic foot	$0.94
Cost per square foot of instructional area (83.3 per cent of total area)	$16.47
Construction cost per pupil (@1,500 students)	$1,471.00

A Breakdown

Construction -	General trades	$ 743,668
	Structural steel	205,639
	Composition roof decks	67,408
	Steel deck and aluminum wall panels	58,853
	Structural wood	87,800
	Acoustical ceilings	64,690
	Glass and glazing	28,020
	Heating, ventilating and plumbing	627,263
	Electrical work	279,072
	Roofing and sheet metal	43,697
	TOTAL CONSTRUCTION COSTS	$2,206,380
Furniture and Equipment		415,895
Site Purchase		74,000
Site Development (including parking lots, drives, walks and landscaping)		160,583
Insurance, Property Protection and Miscellaneous		29,066
Professional Services (architect, engineers, consultant and legal)		141,672
	TOTAL COST	$3,027,596
Total cost per pupil		$2,018



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Reprinted from Modern Physics Buildings: Design and Function

A DIVISIBLE AUDITORIUM/BOULDER CITY, NEVADA

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